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6.7 WIND PROFILER DEMONSTRATION SYSTEM

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The National Oceanic and Atmospheric Administration (NOAA) has started procurement of a 30-station demonstration network of Doppler radar wind profilers to be deployed in the central United States by 1989. Present plans call for twenty-four 405-MHz radars and six 50-MHz radars. The purposes of this demonstration network are: 1) to assess the impact of a large wind profiler network on meteorological forecasting; 2) to test wind profiler hardware designed especially for commercial production and widespread deployment; 3) to provide wind data for research programs involving weather phenomena in the central United States.

The radars will be designed and built by industry under a competitive procurement process. The first step in the procurement is the purchase of two 405-MHz prototype radars and a request for proposals was issued on August 27, 1985. Contract award is expected by March 1986, with delivery of two prototype radars by October 1987. Installation of production models should begin by mid-1988 and be completed by mid-1989.

The radars will operate continuously and unattended with a 6-minute data cycle. During this cycle spectral moment estimates will be made for two range resolution modes on each of three antenna pointing positions. These data will be sent to a central hub computer on land lines. In addition, hourly averaged wind profiles will be calculated and transmitted to the hub computer using the GOES satellite. The Profiler antenna pointing positions will be toward zenith, and about 15 degrees off-zenith in orthogonal planes. From this, East, North, and vertical wind components can be determined. The hub computer will ingest data from the demonstration profiler network and from other research profiler systems. Wind profiles will be calculated, checked for temporal and spatial consistency, broadcast to authorized users, and archived. An important part of the program is the assessment of the data and hardware performance, and will be conducted by the National Weather Service (NWS).

The radars are required to have a mean-time-between-failure of six months. They will have modular construction so that maintenance can be performed by field replacement of defective modules. The data messages will include thorough system status checks. Automatic restart after power fail, lightning protection, and other features needed for operational radars are required. Radar parameters for the 405-MHz units are listed below. Certain specific items such as the type of antenna and type of transmitter are left to the contractor to decide. Also the contractor is to decide the details of the transmitted signal waveform.

Required Antenna Parameters

Number of beams	3
Beam elevation angles	1 @ 90°, 2 @ 75°
Beam switching speed	≤ 0.4 s
On-axis gain	> 32 dBi
3 dB beam width	$< 5^\circ$
Antenna sidelobes (ref. to on-axis gain)	
$\theta \geq 45^\circ$	< -20 dB
$45^\circ > \theta > 5^\circ$	< -25 dB
$5^\circ > \theta$	< -40 dB

Required Transmitter-Receiver Parameters

	High Mode	Low Mode
Frequency	405.25	405.25 MHz
Bandwidth	0.2	0.8 MHz
Operating noise temperature	235	235 K
Pulse width	6 2/3	1 2/3 μ s
Average transmitted power	1500	375 W
Pulse repetition period	153 1/3	100 μ s
First gate	7.5	0.5 km
Last gate	16.25	9.25 km
Number of range gates	36	36
Range resolution	1000	250 m
Range gate spacing	250	250 m
Max horizontal velocity (component)	90	60 m/s
First range ambiguity	183	120 km